# MODULE 2 – FALL ARREST SYSTEMS

### Learning Objectives

- Explain the difference between Fall Prevention and Fall Protection
- Identify the components of a Personal Fall Arrest System
- Evaluate the total fall protection clearance distance needed for a given worksite scenario
- Describe techniques used for self-rescue
- Describe Personal Fall Arrest Systems inspection and maintenance tasks

### What is fall prevention/fall protection?

Although fall hazards are common at construction worksites, fall-related injuries and fatalities are preventable. Fall hazards can be addressed in two main ways :

- **Fall prevention** is preventing workers from falling by using engineering controls (e.g., guardrails and hole covers) or restraint systems.
- **Fall arrest or protection** is preventing injury during and after a fall by using Personal Fall Arrest Systems (PFAS) or safety nets and having an effective rescue plan in place

Recognizing fall hazards and planning to control them before work begins is critical for determining the best methods and equipment for protecting workers during construction activities at heights. The preferred order of fall protection is; engineering controls, a fall restraint system, followed by a fall arrest system

Emergency response planning will identify necessary emergency response training and critical resources (e.g., trained on-site fall arrest rescue team and rescue equipment). OSHA-approved state occupational safety and health plans may have different standards, but those standards must be at least as effective as federal OSHA requirements. More information about state plans is available on the OSHA website at www.osha.gov.

#### Conventional and Alternative Fall Protection Systems

Conventional and Alternative fall protection systems may be separated into two categories:

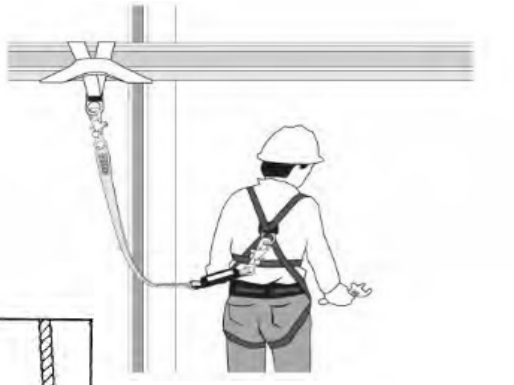
- Active Fall Protection Systems
- Passive Fall Protection Systems

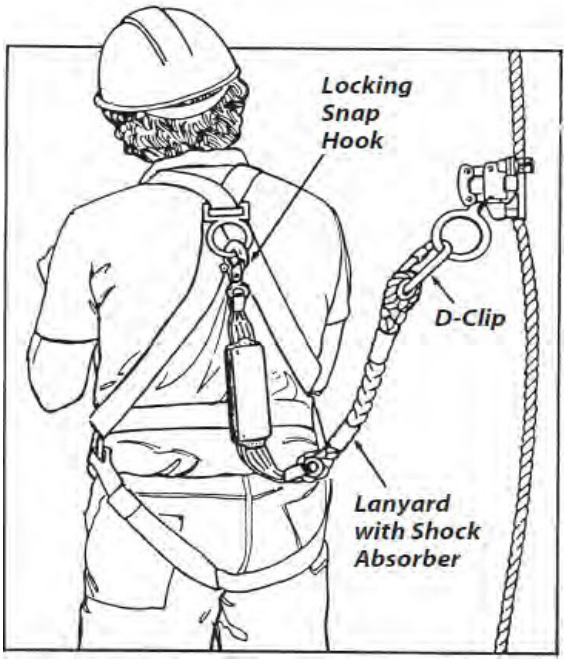
The difference between the two systems is the amount of worker involvement in determining the proper installation and use of the systems. Another consideration when choosing conventional fall protection is whether the fall hazard is eliminated (fall prevention) or controlled (fall protection). A fall prevention system that limits worker involvement and eliminates the fall hazard, such as guardrails and hole covers, is the preferred method for providing worker protection against falls.

| (Active) | (Passive) |
|---|---|
| • Personal Fall Arrest Systems (PFAS)<br>• Positioning Device Systems<br>• Restraint System<br>• Warning Line Systems<br>• Controlled Access Zones<br>• Controlled Decking Zone<br>• Safety Monitoring Systems | • Safety Net Systems<br>• Protection from Falling Objects<br>• Guardrails*<br>• Hole Covers*<br>* Eliminates Fall Hazards |

**Personal Fall Arrest Systems**

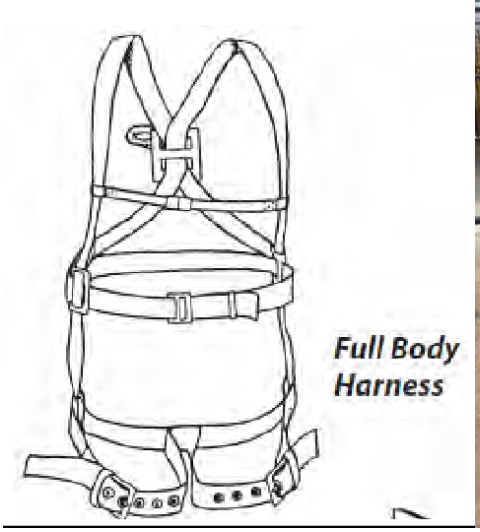
*"Personal fall arrest system" (PFAS)* means a system used to arrest an employee in a fall from a working level. It consists of a body harness, an anchorage, and connectors and may include a lanyard, deceleration device, lifeline, or suitable combinations of these.






**Full Body Harness**

A full body harness is required for fall arrest. Safety harnesses distribute fall-arrest impact through the thighs and buttocks. Safety belts (waist belts) are no longer permitted for use as personal fall arrest equipment. In a fall arrest, they can cause serious damage to internal organs such as the spleen and pancreas.




Harnesses include shoulder straps and leg straps, a sub-pelvic assembly, adjustable buckles or fasteners, and one or more D-rings to connect to a lanyard.

The dorsal D-ring (between the worker's shoulder blades) is used with a fall arrest system. D-rings in other positions are sometimes included for use with ladder safety devices. For this reason, some harnesses come with D-rings on the front, sides, and lower back.

A safe and effective harness will fit (i.e., be the correct size) and is adjusted so that all straps are snug. Dangling leg straps or arm straps are signs that the harness is not being worn correctly.

Although adjustable, some models come in different sizes and may be gender specific.

| *Simple steps to fitting a full body harness*  Inspect |  Position back D-ring between shoulder blades |  Buckle up legs |  Buckle up front |  Adjust so the harness fits snuggly and D-ring remains in the correct position |
|---|---|---|---|---|

**Inspection and Maintenance of Personal Fall Arrest Systems**

To maintain their service life and high performance, all belts and harnesses shall be inspected frequently. Visual inspection before each use is required as is a routine inspection by a competent person. If any of the conditions listed below are found the equipment shall be removed from service and replaced before being used.

**Harness Inspection**

- **Belts and Rings**: For harness inspections begin at one end, hold the body side of the belt toward you, grasping the belt with your hands six to eight inches apart. Bend the belt in an inverted "U." Watch for frayed edges, broken fibers, pulled stitches, cuts or chemical damage. Check D-rings and D-ring metal wear pads for distortion, cracks, breaks, and rough or sharp edges. The D-ring bar should be at a 90 degree angle with the long axis of the belt and should pivot freely.
- **Tongue Buckle**: Buckle tongues should be free of distortion in shape and motion. They should overlap the buckle frame and move freely back and forth in their socket. Rollers should turn freely on the frame. Check for distortion or sharp edges.
- **Friction Buckle**: Inspect the buckle for distortion. The outer bar or center bars must be straight. Pay special attention to corners and attachment points of the center bar.

Attachments of buckles and D-rings should be given special attention. Note any unusual wear, frayed or cut fibers, or distortion of the buckles. Rivets should be tight and unremovable with fingers. Body side rivet base and outside rivets should be flat against the material. Bent rivets will fail under stress.

Inspect frayed or broken strands. Broken webbing strands generally appear as tufts on the webbing surface. Any broken, cut or burnt stitches will be readily seen.

## Lifeline Anchors

Anchorage points should be able to support 5000 pounds. Remember: fall-arrest loads can be as high as 2000 pounds, depending on body weight and fall distance. Suitable anchorages include:

- Designed systems for repair or maintenance work
- Concrete or structural steel columns and beams

Never anchor a fall arrest system to stink pipes, scupper drain covers, handrails, roof hatches, fixed ladders or stairs, vent pipes, formwork, shoring jacks, old masonry, or light structural parapets.

**Attaching Anchors**

OSHA requires that anchors for PFAS be able to hold at least 5,000 pounds of weight per person, or maintain a safety factor of at least two (twice the impact load) under the supervision of a qualified person. Always follow the anchor manufacturer's instructions or consult a qualified person when installing anchors to ensure they are strong enough to hold the sudden weight of a falling worker. OSHA believes that anchorages available on the market will meet the strength requirements if they are installed as per the manufacturer's instructions, with the right number of properly sized nails or screws through the roof sheathing and into one or more roof trusses.

When choosing an anchor to use for fall protection, employers have a number of options; for example:

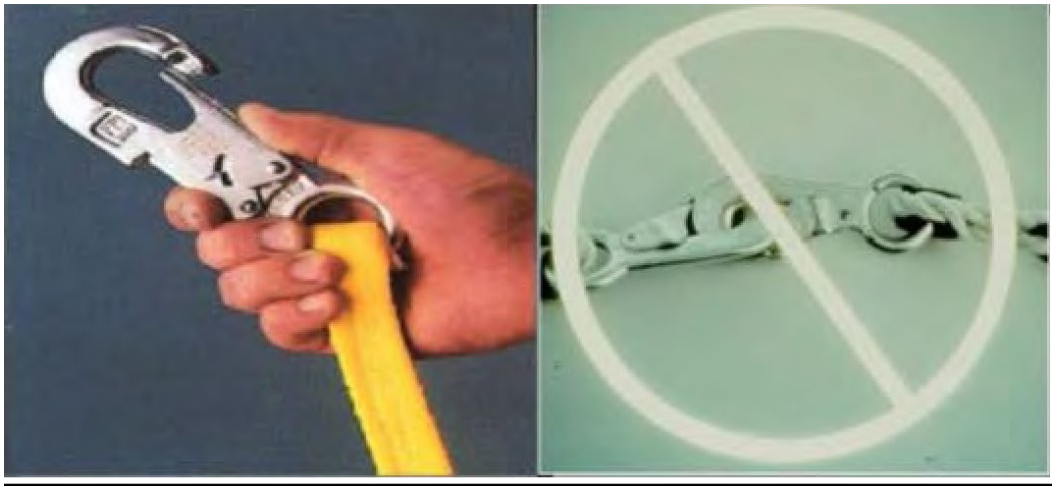
Peak anchor: At the top of the roof, peak anchors are typically solid, non-moving pieces secured to the trusses underneath.

Permanent D-rings: Inexpensive D-ring anchors are attached to the truss frame; they can be left permanently on the roof for future use.

## Lanyards

- Lanyards connect the harness directly to an anchorage such as a rope grab or horizontal static line.
- Lanyards should be either rope or synthetic web straps specifically manufactured for such use.

- Lanyards should have spliced eyes with thimbles and be fitted with locking snap hooks or D-clips for attachment to other components.
- Lanyards with shock absorbers are strongly recommended. Never shorten a lanyard by tying knots in it. Knots seriously reduce rope strength. Also, lanyards are not to be looped over an object and then tied back to itself, unless permitted by the manufacturer.



**Lanyard Inspection**

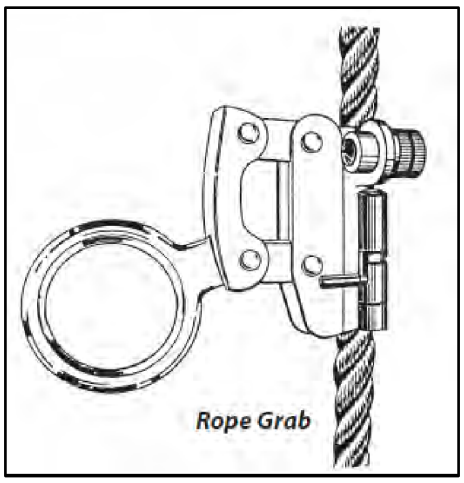
When inspecting lanyards, begin at one end and work to the opposite end. Slowly rotate the lanyard so that the entire circumference is checked. Spliced ends require particular attention. Hardware should be examined under procedures detailed below.

**Hardware**

- **Snaps:** Inspect closely for hook and eye distortion, cracks, corrosion, or pitted surfaces. The keeper or latch should be double locking to prevent rollout.
- **Thimbles:** The thimble (protective plastic sleeve) must be firmly seated in the eye of the splice, and the splice should have no loose or cut strands.
- **Steel Lanyards**: While rotating a steel lanyard, watch for cuts, frayed areas, or unusual wear patterns on the wire. The use of steel lanyards for fall protection without a shock-absorbing device is not recommended. Do not use steel lanyards in the presence of electrical hazards.
- **Web Lanyard:** While bending webbing over a piece of pipe, observe each side of the webbed lanyard. This will reveal any cuts or breaks. Due to the limited elasticity of the web lanyard, fall protection without the use of a shock absorber is not recommended.
- **Rope Lanyard**: Rotation of the rope lanyard while inspecting from end to end will bring to light any fuzzy, worn, broken or cut fibers. Weakened areas from extreme loads will appear as a noticeable change in original diameter. The rope diameter should be uniform throughout, following a short break-in period. When a rope lanyard is used for fall protection, a shock-absorbing system should be included.

**Rope Grabs**

Mechanical rope grabs are used to attach lanyards to vertical lifelines. Most rope grabs employ a device that locks on the lifeline when the lanyard is sharply tugged or pulled. Rope grabs must be installed in the right direction. Most grabs are marked with an arrow to indicate correct orientation.




**Visual Indication of Damage to Webbing and Rope Lanyards**

- Heat - In excessive heat, nylon becomes brittle and has a shriveled brownish appearance. Fibers will break when flexed and should not be used above 180 degrees Fahrenheit.
- Chemical - Change in color usually appears as a brownish smear or smudge. Transverse cracks appear when belt is bent over tight. This causes a loss of elasticity in the belt.
- Ultraviolet Rays - Do not store webbing and rope lanyards in direct sunlight, because ultraviolet rays can reduce the strength of some material.
- Molten Metal or Flame - Webbing and rope strands may be fused together by molten metal or flame. Watch for hard, shiny spots or a hard and brittle feel. Webbing will not support combustion, nylon will.
- Paint and Solvents - Paint will penetrate and dry, restricting movements of fibers. Drying agents and solvents in some paints will appear as chemical damage.

## Shock Absorbers

Shock absorbers are strongly recommended for use in fall- arrest systems. They are absolutely necessary with wire rope lifelines. Shock absorbers can reduce fall-arrest loads by as much as 50%.

Some shock absorbers are built into the lanyard. Most are made of webbing material with tear-away stitching designed to gradually absorb a fall-arrest load.

The tear-away type also gives clear indication that fall arrest has occurred and that the system should be replaced. This results in better quality control for field equipment. Any fall arrest component involved in a fall arrest should be taken out of service to prevent reuse. It's done the job it was designed to do!

**Shock-Absorbing Packs Inspection**

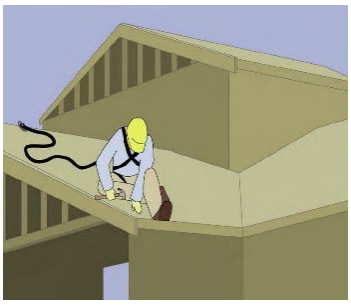
The outer portion of the shock-absorbing pack should be examined for burn holes and tears. Stitching on areas where the pack is sewn to the D-ring, belt or lanyard should be examined for loose strands, rips and deterioration.

## Cleaning of Equipment

- Basic care for fall protection safety equipment will prolong and endure the life of the equipment and contribute toward the performance of its vital safety function.
    - Proper storage and maintenance after use is as important as cleaning the equipment of dirt, corrosives or contaminants.
    - The storage area should be clean, dry and free of exposure to fumes or corrosive elements.
- Nylon and Polyester - Wipe off all surface dirt with a sponge dampened in plain water.
    - Squeeze the sponge dry. Dip the sponge in a mild solution of water and commercial soap or detergent.
    - Work up a thick lather with a vigorous back and forth motion. Then wipe the belt dry with a clean cloth. Hang freely to dry but away from excessive heat.
- Drying - Harness, belts and other equipment should be dried thoroughly without exposure to heat, steam or long periods of sunlight.

## Lifelines

**Vertical Lifelines:**

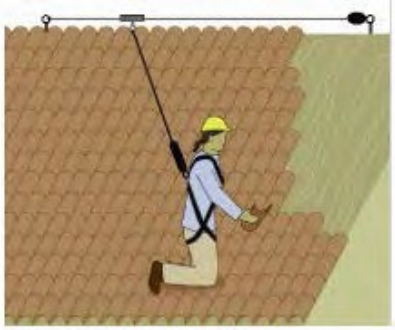


Vertical lifelines must be:

- capable of sustaining a 5000 pound load;
- used by only one worker at a time;
- free of cuts, abrasions, and other defects;
- protected from chafing and abrasion;
- anchored to a fixed support;
- long enough to reach the ground (or a safe landing level above ground); and
- must be knotted at the bottom to prevent the grab from sliding off the end.

**Horizontal Lifeline:**

An engineered horizontal lifeline system, when used as part of a PFAS, is another way to increase the area in which a worker is protected. Horizontal lifelines must be designed, installed, and used, under the supervision of a qualified person system following the manufacturer's instructions.



Horizontal Lifeline

Install a continuous pass through horizontal lifeline. It allows workers to move through multiple spans with 100% tie-off at all times. Horizontal lifelines with automatic pass through eliminate the need for workers to un-clip from the lifeline to move past intermediate anchor points, keeping both hands free at all times.

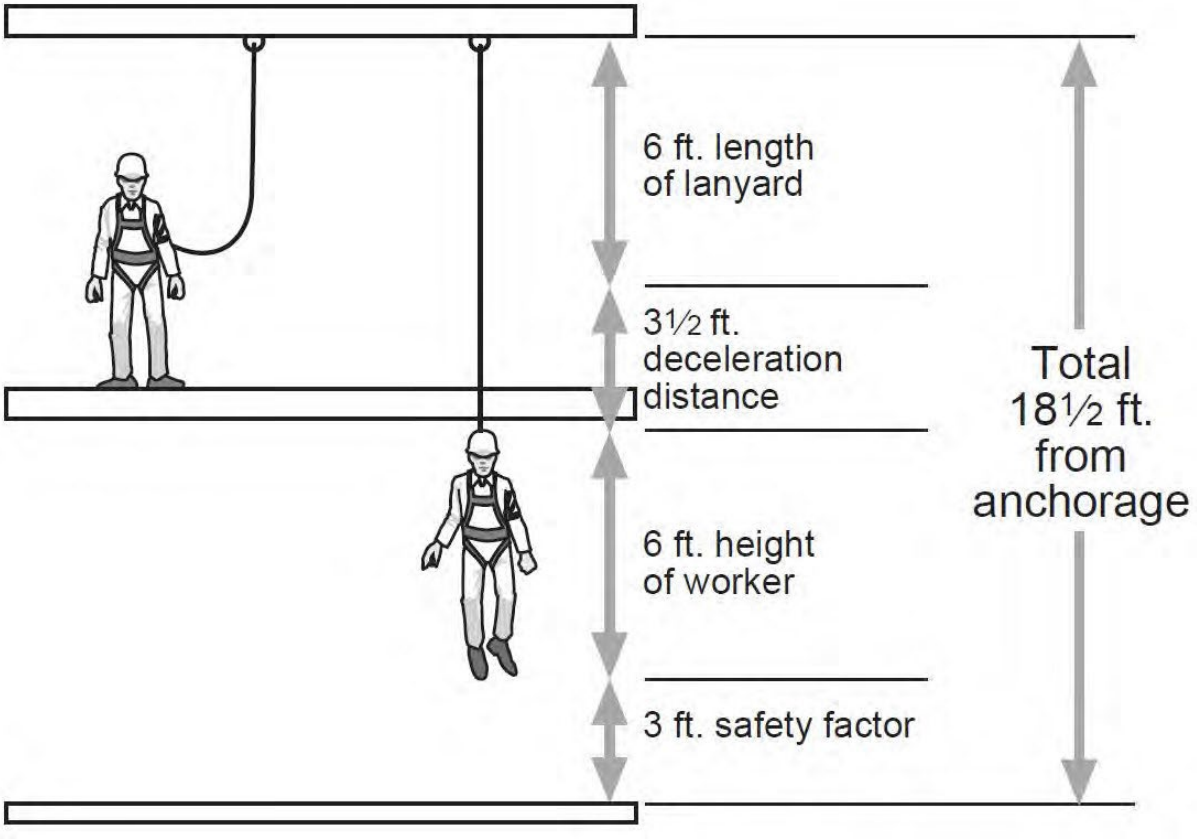
Horizontal lifelines must be designed to maintain a safety factor of at least two (twice the impact load). When using a self-retracting lifeline be sure to check the manufacturer guidelines, make sure the lines do not run over an unpadded, sharp edge. Be sure to evaluate the potential for a swing fall.

## Using Fall Arrest Systems Safely

Ensure that personal fall arrest systems will, when stopping a fall:

- Limit maximum arresting force to 1,800 pounds.
- Be rigged such that an employee can neither free fall more than 6 feet nor contact any lower level.
- Bring an employee to a complete stop and limit maximum deceleration distance to 3½ feet.
- Have sufficient strength to withstand twice the potential impact energy of a worker free falling a distance of 6 feet, or the free fall distance permitted by the system, whichever is less.
- Remove systems and components from service immediately if they have been subjected to fall impact, until inspected by a competent person and deemed undamaged and suitable for use.
- Promptly rescue employees in the event of a fall, or assure that they are able to rescue themselves.
- Inspect systems before each use for wear, damage, and other deterioration, and remove defective components from service.
- Do not attach fall arrest systems to guardrail systems or hoists.

**Distance of fall**



**Measurements for Assessing Fall Hazards and Controls**

A few basic measurements and equations can aid in evaluating if a PFAS will be sufficient to prevent workers from contacting a lower level. This section provides information on evaluating:

- The necessary total fall clearance distance for PFASs
- Swing fall hazards for PFASs

**Total Fall Clearance Distance for PFAS**

The total fall clearance distance is the minimum vertical distance between the worker and the lower level that is necessary to ensure the worker does not contact a lower level during a fall. The total fall clearance distance is calculated *before* a decision is made to use a PFAS. If the available distance is not greater than the total fall clearance distance, it is inappropriate to use the PFAS and a fall restraint system might be used instead. Total fall clearance distance calculations are simple to perform based on several factors, including:

The maximum free fall distance when using PFAS must be 6 feet or less!

- Lanyard length;
- The height at which the lanyard is anchored relative to where the other end attaches to the worker's harness;
- The distance the worker will travel as the deceleration device absorbs the energy from the fall (i.e., slows it down);
- The worker's height;
- D-ring shift; and
- A safety factor.

The following variables are necessary to calculate the total fall clearance distance:

- *Free fall distance*: This is the distance the worker falls before the PFAS begins to slow the fall. When using a PFAS, this distance must be 6 feet or less and also prevent the worker from contacting a lower level.
- Free fall distance varies depending on the lanyard's length and where the anchor is set relative to the back D-ring on the harness.
- *Deceleration distance*: This is the distance the lanyard stretches in order to arrest the fall. Deceleration distance must be no greater than 3.5 feet.
- *D-ring shift*: This is the distance the D-ring moves and the harness shifts when they support the worker's full weight. This shift is often assumed to be one foot, but it can vary, depending on the equipment design and the manufacturer.
- *Back D-ring height* The D-ring height is measured as the distance between the D-ring and the worker's shoe sole while the worker is wearing the harness. This height is often standardized as five feet for six-foot-tall workers (shorter workers may also be protected using this default distance). It is necessary to adjust the back D-ring height for workers exceeding six feet.
- *Safety factor:* A safety factor is an additional distance added to the total fall clearance distance to ensure there is enough clearance between the worker and the lower level after a fall. It is typically 2 feet.

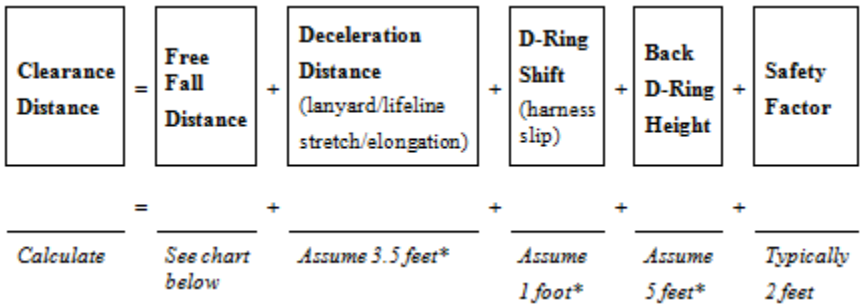
The total fall clearance distance is calculated by adding these values together.

**Calculating Total Fall Clearance Distance for Fall Arrest Systems with a Shock-absorbing Lanyard**

Common assumptions:

- Deceleration distance: 3.5 feet (the maximum per OSHA requirements.
- D-ring shift: 1 foot.
- D-ring height (shoe sole to point between shoulder blades): 5 feet.
- Safety factor: typically 2 feet.

The equation below shows how to add the various values in order to calculate total fall clearance distance. A fall arrest system will not protect a falling worker if the calculated clearance distance is greater than the actual distance available below the elevated work area (measured as the distance between the point at which a worker would be anchored and any lower surface).




* If actual workplace values or manufacturer specifications are available, or if circumstances dictate the need to use alternative values, use them instead.

**Calculating Free Fall Distance**

**Calculating free fall distance based on D-ring location:**

*D-ring **ABOVE Anchor***

Free fall distance = Lanyard length + Distance from D-ring to anchor

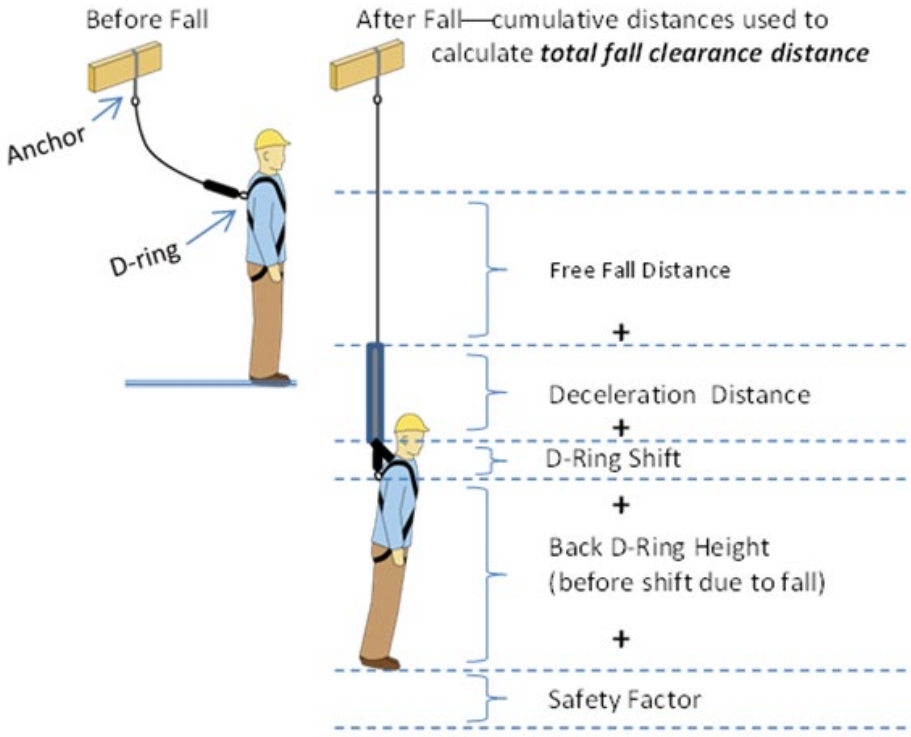
*D-ring **BELOW anchor***

Free fall distance = Lanyard length - Distance from D-ring to anchor

*D-ring **LEVEL with anchor***

Free fall distance = Lanyard length

This table applies to a worker using a shock-absorbing lanyard (e.g., ripstitch lanyard). Self-retracting lanyards typically activate, and thus limit free fall distance, within 2 feet. Refer to manufacturer specifications for activation details.



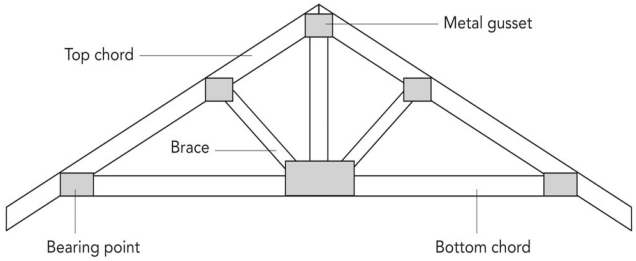

**Fall Distance Exercise**

*Exhibit 2-1: Fall Clearance Distance Exercise* provides the opportunity to practice the calculations we have discussed that are used when determining fall clearance. You can refer to the information on the previous pages to complete this exercise. Fill in the correct numbers in the spaces provided. This will include:

- the free fall distance;
  (HINT: You must determine where the D-Ring is placed in relationship to the anchor to perform this calculation correctly. Remember to make sure the maximum free fall distance is not exceeded! If the maximum free fall distance is exceeded, adjustments must be made to the anchor point.)
- the deceleration distance;
- the D-ring shift;
- the back D-ring height; and
- the safety factor.

You may use common assumptions for the deceleration distance, D-ring shift, back D-ring height and safety factor.

## EXHIBIT 2-1: Fall Distance Calculations Exercise




**Example 1a:** A worker is framing an attic. The worker will wear a PFAS with a 6-foot rip-stitch lanyard tied off to an anchor 5 feet between the anchor and the D-ring, attached to a truss' bottom chord. He will also be standing on the same bottom chord (so the anchor will be at foot level). Calculate the total fall clearance distance and determine whether or not this configuration is acceptable.

| Free Fall Distance | | Deceleration Distance | | D-Ring Shift | | Back D-Ring Height | | Safety Factor | | Fall Clearance Distance |
|---|---|---|---|---|---|---|---|---|---|---|
| | + | | + | | + | | + | | = | |

**Conclusion:** _____

**Example 1b:** A competent person sees that the trusses in the adjacent section have been installed, fastened in place, and sheathed, and are stable enough to serve as an anchorage. An anchor is installed 2 feet above the back D-ring on the worker's harness. What is the total fall clearance distance?

| Free Fall Distance | | Deceleration Distance | | D-Ring Shift | | Back D-Ring Height | | Safety Factor | | Fall Clearance Distance |
|---|---|---|---|---|---|---|---|---|---|---|
| | + | | + | | + | | + | | = | |

**Conclusion:** _____

**Example 2:** A worker on a concrete wall is wearing a PFAS tied off to a concrete anchor strap, which is 1 foot below his D-ring. His shock-absorbing lanyard is 2 feet long. What is the total fall clearance distance?

| Free Fall Distance | | Deceleration Distance | | D-Ring Shift | | Back D-Ring Height | | Safety Factor | | Fall Clearance Distance |
|---|---|---|---|---|---|---|---|---|---|---|
| | + | | + | | + | | + | | = | |

**Conclusion:** _____

## EXHIBIT 2-1: Fall Distance Calculations Exercise (page 2)

**Example 3: A** worker welding in a warehouse is using a PFAS. The system includes a 4-foot shock-absorbing lanyard that is anchored to an I-beam clamp, level with the D-ring on her upper back. What is her total fall clearance distance?

| Free Fall Distance | | Deceleration Distance | | D-Ring Shift | | Back D-Ring Height | | Safety Factor | | Fall Clearance Distance |
|---|---|---|---|---|---|---|---|---|---|---|
| | + | | + | | + | | + | | = | |

**Conclusion:** _____

**Example 4:** A construction worker is wearing a PFAS including a 6-foot rip-stitch lanyard. He uses a strap anchor to tie off around a steel ceiling joist 4 feet above the D-ring on his back. What is the total fall clearance distance?

| Free Fall Distance | | Deceleration Distance | | D-Ring Shift | | Back D-Ring Height | | Safety Factor | | Fall Clearance Distance |
|---|---|---|---|---|---|---|---|---|---|---|
| | + | | + | | + | | + | | = | |

**Conclusion:** _____

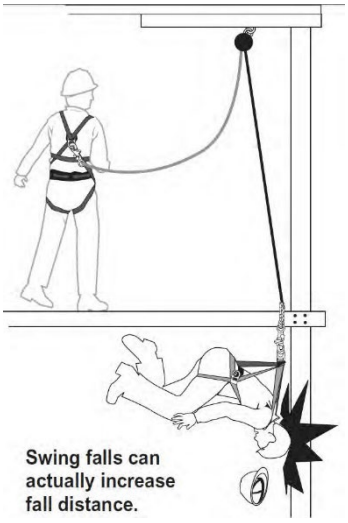
**Example 5:** The same construction worker is now using a self-retracting lanyard that activates (locks) within 2 feet if he falls. This new lanyard is connected to the same steel ceiling joist 4 feet above the D-ring on his back. What is the total fall clearance distance?

| Free Fall Distance | | Deceleration Distance | | D-Ring Shift | | Back D-Ring Height | | Safety Factor | | Fall Clearance Distance |
|---|---|---|---|---|---|---|---|---|---|---|
| | + | | + | | + | | + | | = | |

**Conclusion:** _____

**How to Evaluate the Swing Fall Hazard**

The swing fall hazard is created by the pendulum effect, which can swing a fallen worker into a nearby surface, such as a wall or protruding beam. In addition to calculating the total fall clearance distance before beginning work on an elevated level, it is important to evaluate the swing fall hazard at the edges where a worker might fall. A worker who falls while connected to an anchor (unless it is directly overhead) will swing back and forth like a pendulum. Workers can be seriously injured if they strike objects during a swing fall. Installing the anchorage point directly above the work area (i.e., connected to an overhead attachment point with sufficient strength) will help prevent injury.




## Fallen Worker Rescue

Rig fall arrest systems to allow movement of the worker only as far as the edge ofthe walking/working surface, when used at hoist areas. An effective fallen worker rescue plan addresses the procedures, equipment, and personnel needed to ensure that a rescue proceeds quickly and efficiently when a fall occurs. Even when a PFAS works properly, the fallen worker is still in danger. The worker's body weight places pressure on the harness straps, which can compress the veins, and cause blood to pool, in the lower extremities and reduce blood return to the worker's heart.

This condition is called suspension trauma, also known as harness hang syndrome. In medical terms, this results in orthostatic intolerance. If the pressure is not reduced promptly, the worker can lose consciousness within minutes. To delay post suspension trauma, activate the rescue plan immediately.

Self-rescue and aided rescue are two techniques for rescuing a suspended worker. Rescuing the worker promptly (i.e., aided rescue) or ensuring the worker can self-rescue is imperative to preventing injury or a fatality.

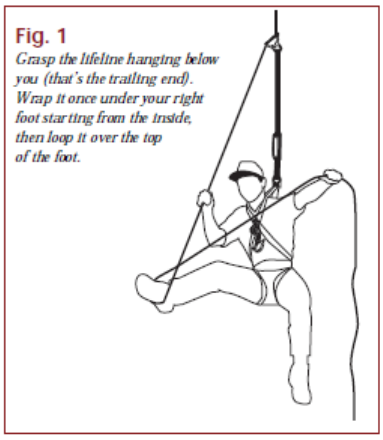
**Self-Rescue**

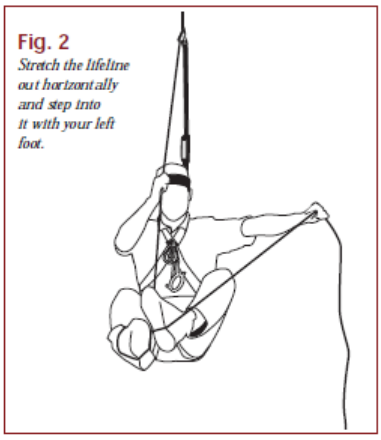
With proper personal fall protection equipment, training and practice, a fallen worker can take steps to minimize suspension trauma. If you can’t relieve the pressure it exerts on your legs, which constricts blood flowing back to your heart, you could lose consciousness. Self-rescue methods allow a fallen worker to temporarily relieve pressure on the legs or in some cases to even lower himself or herself to the lower level. The first thing you should do is relieve the harness pressure; the foot wrap will relieve the pressure and allow you to climb up or down for short distances.

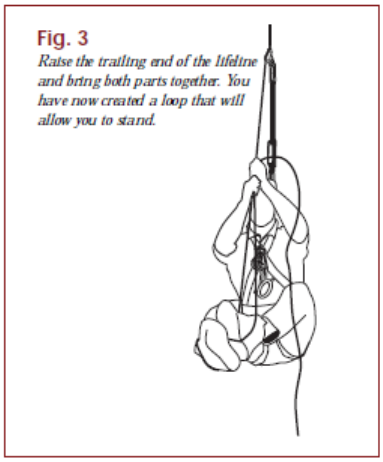
**How to do a foot wrap**

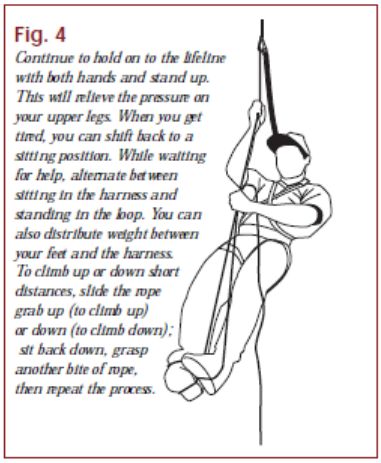
**Necessary equipment**

A *personal fall-arrest system* (including *body harness*, *connectors*, secure *anchor*, vertical *lifeline*, *lanyard*, and a *rope grab*).




**Aided Rescue**

A worker who is suspended from a lifeline and cannot perform a self-rescue will need help from trained rescuers using appropriate equipment, including appropriate fall protection. Off-site emergency response personnel may rescue suspended workers, although most 911 responders are not trained in how to do so.

Consider, for example, the worker who has a heart attack and falls or a suspended worker who is injured as a result of the fall. Aided rescues involve trained rescuers and appropriate equipment. Keep in mind the following in deciding what equipment is appropriate:

- Can you use extension ladders, forklifts, or elevating platforms to perform aided rescues — or do you need technical rescue equipment?
- Will the equipment be available and ready to use when you need it?
- Can rescuers always reach a suspended worker with the equipment?
- Do rescuers know how to use the equipment?

If possible, use on-site equipment such as extension ladders, forklifts, or elevating platforms for aided rescues. Only if this equipment isn't available or isn't appropriate should you consider using technical rescue equipment. Technical equipment appropriate for aided rescues includes pulley systems, brake-tube systems, and winch systems. Each has advantages and disadvantages.

## Module 2 Key Take-aways

- Preventing workers from falling by using engineering controls (e.g., guardrails and hole covers) or restraint systems is known as *fall prevention*.
- Preventing injury during and after a fall by using Personal Fall Arrest Systems (PFAS) or safety nets and having an effective rescue plan in place is known as *fall arrest/protection.*
- The preferred order of fall protection is (1) engineering controls, (2) a fall restraint system, followed by (3) a fall arrest system.
- *"Personal fall arrest system" (PFAS)* means a system used to arrest an employee in a fall from a working level. It consists of a body harness, an anchorage, and connectors and may include a lanyard, deceleration device, lifeline, or suitable combinations of these.
- Safety belts (waist belts) are no longer permitted for use as personal fall arrest equipment.
- Anchorage points should be able to support 5000 pounds.
- Always follow the anchor manufacturer's instructions, consult a qualified person when installing and using anchors.
- Never shorten a lanyard by tying knots in it.
- Lanyard must not to be looped over an object and then tied back to itself.
- The total fall clearance free fall distance cannot exceed 6 feet.
- Self-retracting lanyards limit free fall distance to nor more than 2 feet.
- Visual inspection before each use is required as is a routine inspection by a competent person.

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